Jan. 26, 1937. F. HOLLMANN 2,069,035

DEVICE FOR DETECTING THE PRESENCE OF FOREIGN GASES OR SUSPENSIONS IN AIR OR OTHER GAS

Filed July 9, 1934

Fig. 1.

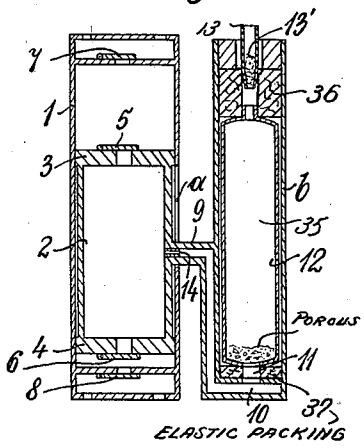


Fig. 3.

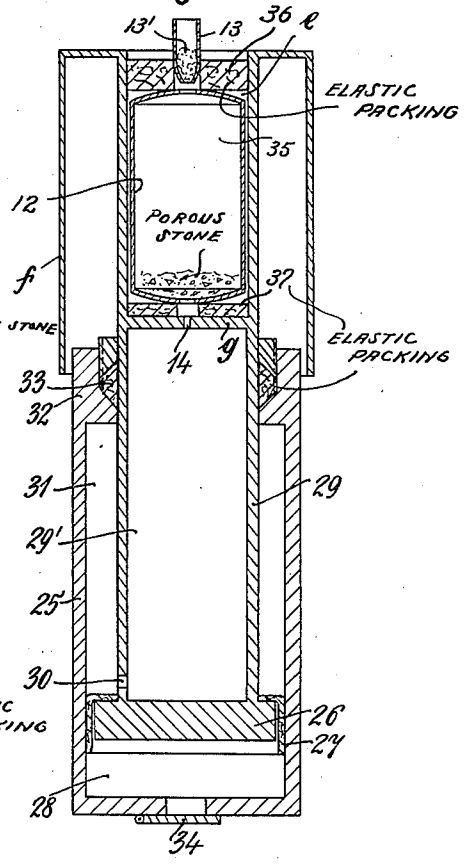
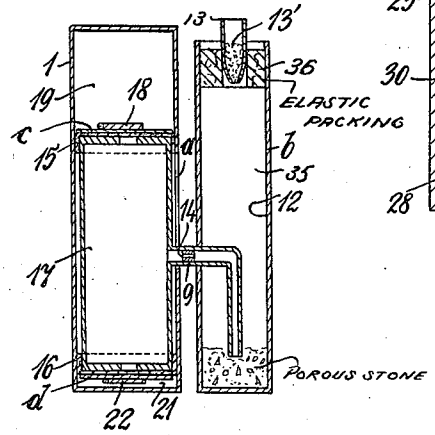


Fig. 2.



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DEVICE FOR DETECTING THE PRESENCE OF FOREIGN GASES OR SUSPENSIONS IN AIR OR OTHER GAS

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4 Claims. (Cl. 23—254)

This invention relates to a device for detecting the presence of foreign gases or suspensions in air or other gas.

A device according to the invention consists in a double-acting gas pump, operating with or without a receiver, and contrived to force the air or gas to be tested in a steady stream through or over an intercepting or reacting medium.

The air pump may consist of a barrel which is provided with non-return valves, and in which is arranged a reciprocatory hollow piston, the cavity of which serves as a receiver and the end faces of which are each provided with a non-return valve and act as piston faces. In the wall of the barrel there may be provided a slot which serves for guiding a tube which is rigidly connected both with the hollow piston and with a container for the intercepting or reacting medium. The hollow piston may also be guided by cup washers in the barrel, the washers permitting the air to pass in one direction only. Above the washers, there are preferably arranged discs which may carry valves. The container for the intercepting or reacting medium may serve at the same time for reception of a layer which retains moisture, for example, of a layer of small pieces of porous stone or the like. As a pump piston there may be used a differential piston which is preferably so constructed that the area of the larger face of the piston is about twice the cross-sectional area of the piston rod. The piston rod may be formed hollow and provided with a port opening into an annular chamber between the pump barrel and the piston rod. It is preferred to guide the barrel air-tightly on the piston rod which carries the pump piston at one end and carries at the other end a container which serves for reception of a receptacle for the intercepting or reacting medium and of a container for a layer for trapping liquid or moisture. A tube surrounding the container and open at the lower end may serve as a handle in the use of the device. Finally, there may be incorporated in the device a throttle nozzle through which the air must pass before entering the receiver.

In the accompanying drawing Fig. 1 is a vertical section illustrating one embodiment of the invention; Fig. 2 illustrates a second embodiment, and Fig. 3 a third embodiment.

In the construction illustrated in Fig. 1, the pump barrel 1 is disposed alongside a container *b* for intercepting or reacting medium. In the pump barrel 1, which is provided with non-return valves 7 and 8, there is arranged a hollow piston 2 the end faces 3 and 4 of which are provided with non-return valves 5 and 6. The pump barrel 1 is provided with a slot *a* through which projects a tube 9. In the embodiment illustrated this tube 9 receives a throttle nozzle 14 and is rigidly connected with the container *b* and piston 2. The tube 9 debouches at 10 into the container in which is located a vessel 12 containing a layer adapted to trap moisture, for example, a layer of small pieces of porous stone and carrying at its upper end a small tube 13 containing the intercepting or reaction medium 13'. This reaction medium 13' may consist of any suitable material which, when brought into contact with the gas for which the test is made, will give a visible or other suitable indication of the presence of such gas. The layer of porous nature traps any entrained particles of liquid reacting medium. 11 is a port leading from the chamber 10 to the vessel 12. When the device is to be used, the pump barrel 1 is held fast with one hand and the container *b* is reciprocated with the other hand, the tube 9 moving in the slot *a*. Besides the guidance by the connecting tube 9 there may be provided additional parallel guiding means of known type between the pump barrel 1 and the container *b*.

The embodiment illustrated in Fig. 2 differs from that illustrated in Fig. 1 primarily in this respect that the hollow piston 17 is guided by aid of one-way cup washers 15, 16 in the pump barrel 1. Also in this construction the pump barrel 1 is arranged alongside the container *b*. Also the tube 9 is of somewhat different shape and is differently connected to the container *b*. On the descent of the piston 17 a vacuum is set up in the upper compartment 19 of the pump barrel 1, so that air is sucked through the intercepting or reacting medium 13, the container *b*, the tube 9, the nozzle 14, the cavity of the piston 17 and the non-return valve 18 into the chamber 19. On ascent of the piston 17 a vacuum is set up in the compartment 21 so that the air enters through the non-return valve 22 into this compartment. The air previously present in the compartments 19 and 21 is liberated past the washers 15, 16 and through the slot *a* to atmosphere, the washers 15, 16 each affording a seal only in one direction of movement of the piston.

The modification according to Fig. 3 represents a substantially simplified construction. In this case the pump is located beneath the container 35 for the intercepting or reacting medium 35'. Further, there is utilized a differential piston 26, 29. The area of the larger face of the piston 26 is about twice that of the cross-sectional area of the piston rod 29. The piston 26 is packed

relatively to the pump barrel 25 by means of a cup washer 27. At its lower end the pump barrel 25 is provided with a non-return valve 34. No other valves are provided. The cylinder head 32 is made tight with respect to the piston rod 29 by means of elastic packing 33. The hollow piston rod 29 is divided into two chambers by a wall *g* presenting a nozzle 14. In the top chamber is a vessel 36 containing a layer which serves to trap liquid. Above said vessel is the tube for the intercepting or reacting medium 35. The bottom chamber or receiver 29' is connected by way of a port 30 with an annular chamber 31 located between the piston rod 29 and the pump barrel 25. At the upper part of the device is a tube *f* open at its lower end.

In the use of the device the tube *f* is gripped with one hand and the pump barrel 25 with the other hand, and these two elements are relatively reciprocated. On ascent of the piston 26 the valve 34 closes and a vacuum is set up in the chamber 28 so that the air in the annular chamber 31 flows past the cup washer 27 into the chamber 28. As the cross section of chamber 28 is twice as large as the cross section of annular chamber 31 (outside tube 29) air flows in from outside through the medium 35', through the vessel 36, the receiver 29', and through the chamber 31. On descent of the piston 26 the cup washer 27 closes so that the air present in the chamber 28 is ejected through the valve 34. At the same time there is set up a vacuum in the annular chamber 31 so that fresh air again flows in through 35 and 36 to the receiver 29'. The nozzle 14 serves to maintain a steady stream of air also during the reverse movement of the piston.

The new device is of simple construction, easy to handle and there are no complicated parts. The device can therefore be kept in stock and can be readily freed from toxic substances after use.

What I claim is:

1. A portable and manually operable device for detecting the presence of foreign gases or suspensions in air or other gases comprising a container having detecting material therein, a double acting pump including a cylinder and a hollow piston reciprocal therein, passage means connecting the interior of said hollow piston with the cylinder, rigid means connecting said container to said piston and a passage means connecting said container and the interior of said piston, whereby the gas to be tested is forced in a steady stream through said detecting material by reciprocating said cylinder and said connecting means.

2. In a device as claimed in claim 1, a moisture trapping layer in said passage means between the container and the piston.

3. A portable and manually operable device for detecting the presence of foreign gases or suspensions in air or other gases comprising a container having detecting material therein, a double acting pump comprising a cylinder and a hollow piston reciprocal therein, said piston having non-return valves at both ends opening into the cylinder, the wall of said cylinder having a longitudinal slot, rigid hollow means connecting said container to the side wall of said hollow piston through said slot, whereby the gas to be tested is forced in a steady stream through said detecting material by reciprocating said cylinder and said connecting means.

4. A portable and manually operable device for detecting the presence of foreign gases or suspensions in air or other gases comprising a container having detecting material therein, a double acting pump comprising a cylinder and a hollow differential piston reciprocal therein, a rigid hollow piston rod connecting said differential piston and said container, the area of the larger face of said piston being substantially twice the cross sectional area of the piston rod, and means for passing gas from the interior of the differential piston to the cylinder, whereby the gas to be tested is forced in a steady stream through said detecting material by reciprocating said cylinder and said connecting means.

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